North Dakota Introduction & Foundations of Agriculture

Content Standards

Approved and Adopted
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North Dakota Department of Career and Technical Education
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The North Dakota State Board for Career and Technical Education has reviewed this standards document, approved the content, and officially adopted the material until 2010.

North Dakota
Introduction & Foundations of Agriculture
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Table of Contents

North Dakota

Introduction & Foundations of Agriculture Standards

Introduction

The North Dakota Department of Career and Technical Education is committed to working on standards to ensure that each program area can offer courses that allow students to acquire knowledge and skills. CTE not only provides technical skills and knowledge for students to succeed in careers, but also cross-functional workplace skills such as teamwork, problem solving, and the ability to find and use information, and provides the context in which traditional educational goals and academic skills can be enhanced.

The standards process is one that directly involves the state supervisor(s), the curriculum administrator for this agency, and teachers working directly with the content at hand. Once the standards are written and expectations are clearly defined, the standards are then compared and aligned with national and industry standards.

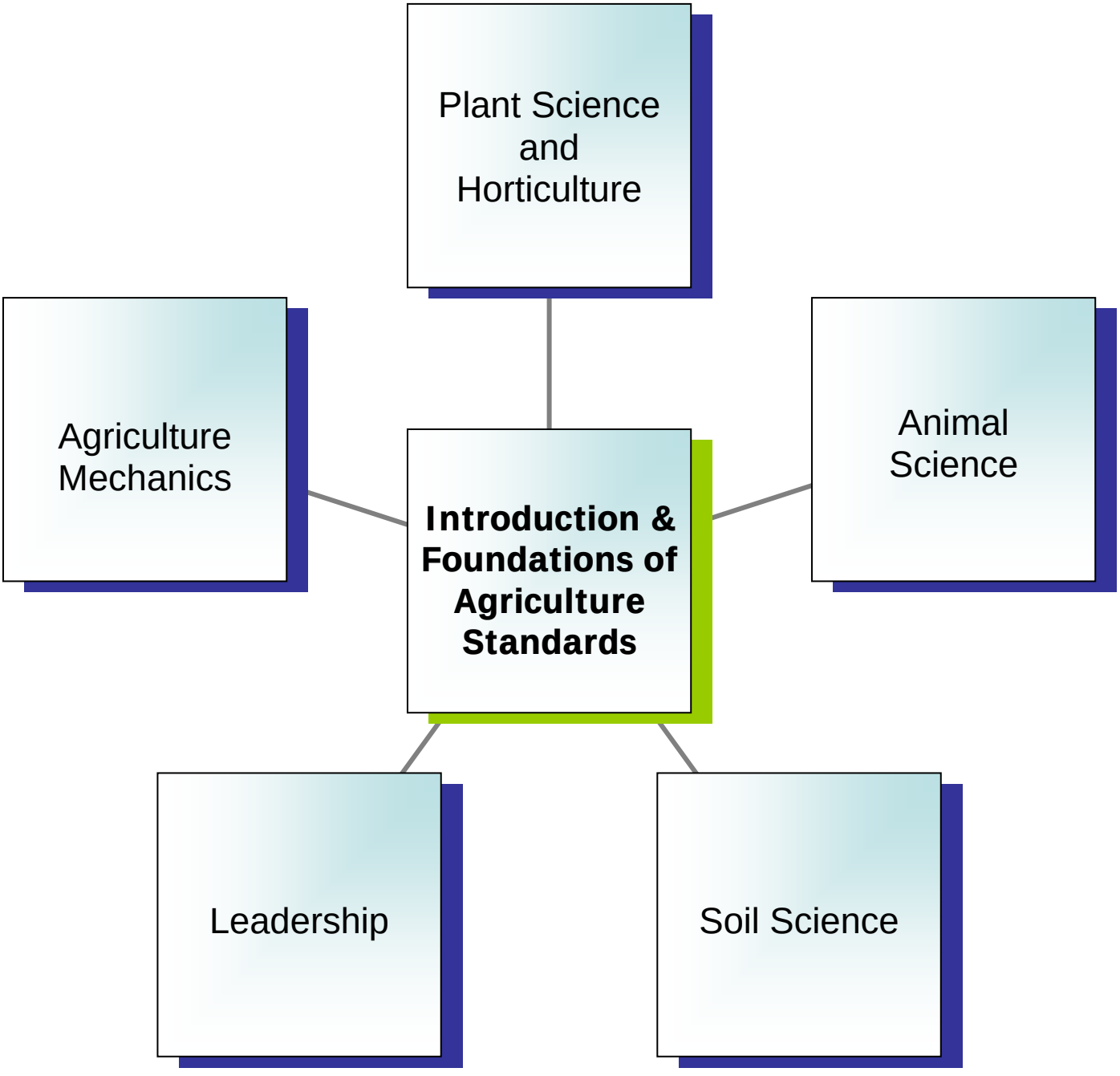
The Department of Career and Technical Education strongly believes in the importance of academic integration within each program area. The standards produced for each program area will be cross walked with the most current academic drafts of English Language Arts, Mathematics, and Science. When possible, standards will be cross walked with other academic areas that correspond.

Definitions

For each standard, there is one or more topic statements along with competencies for each topic. The competencies are categorized into three divisions: Introductory, Core, and Advanced. These divisions can further be defined as:

Introductory:	Knowledge Acquisition – Learners at this level expand awareness and build comprehension of knowledge.
Core:	Application – Learners at this level experience acquired knowledge by applying it to situations and self.
Advanced:	Reflection – Learners at this level analyze, synthesize, judge, assess, and evaluate knowledge in accord with their own goals, values, and beliefs, and/or real situations.

Overview of Standards



Standards at a Glance

COMPREHENSIVE STANDARDS

1.0 PLANT SCIENCE AND HORTICULTURE
- Understand basic concepts and principles of plant science and horticulture.

2.0 ANIMAL SCIENCE
- Understand basic concepts and principles of animal science.

3.0 SOIL SCIENCE
- Understand basic concepts and principles of soil science.

4.0 LEADERSHIP
- Demonstrate fundamentals of leadership within FFA and SAE's.

5.0 AGRICULTURE MECHANICS
- Demonstrate fundamentals of agriculture mechanics.

Standards with Topics

CONTENT STANDARDS

1.0 PLANT SCIENCE AND HORTICULTURE

- Understand basic concepts and principles of plant science and horticulture.
  - 1.1 Discover the scope of plant products in ND and local community.
  - 1.2 Demonstrate fundamental skills in plant sciences and horticulture.
  - 1.3 Identify common weeds in ND and local community.
  - 1.4 Investigate career opportunities in the area of plant sciences.

2.0 ANIMAL SCIENCE

- Understand basic concepts and principles of animal science.
  - 2.1 Discover the scope and importance of animal science industry in North Dakota and United States.
  - 2.2 Demonstrate fundamental skills associated with animal science.
  - 2.3 Describe the digestion and nutritional/feed requirements of livestock.
  - 2.4 Describe the physiology of reproduction in livestock.
  - 2.5 Investigate career opportunities in the area of animal sciences.

3.0 SOIL SCIENCE

- Understand basic concepts and principles of soil science.
  - 3.1 Demonstrate fundamental skills in soil science.
  - 3.2 Understand land use and typical soils in a community.
  - 3.3 Uncover the role of ecology and conservation in environment.
  - 3.4 Investigate career opportunities in soil science.

4.0 LEADERSHIP

- Demonstrate fundamentals of leadership within FFA and SAE's.
  - 4.1 Demonstrate leadership concepts and goal setting.
  - 4.2 Understand FFA activities and opportunities.
  - 4.3 Understand basic communication skills.
  - 4.4 Understand the SAE, entrepreneurship, record keeping and employment skills.

5.0 AGRICULTURE MECHANICS

- Demonstrate fundamentals of agriculture mechanics.
  - 5.1 Understand knowledge and skills in agriculture mechanics.
  - 5.2 Understand safety precautions and appropriate behavior associated with agriculture mechanics.
  - 5.3 Understand, identify, and operate hand tools & power tools.
  - 5.4 Demonstrate proficiency in welding and cutting techniques.

Standard 1: PLANT SCIENCE AND HORTICULTURE – Understand basic concepts and principles of plant science and horticulture.

Topic 1: Discover the scope of plant products in ND and local community.

Student Competencies

Introductory

1.1.1 Identify the major plants grown in ND (e.g. crops, trees, range plants, etc.).
1.1.2 Describe uses of ND plants.
1.1.3 Identify plant products used in society.
1.1.4 Evaluate the economic importance of plant products in ND.
1.1.5 Define biotechnology.

Core

1.1.6 Determine differences between different seed/plant types.
1.1.7 Identify crops by seed and plant (e.g. at different plant growth stages, etc.).
1.1.8 Recognize growth requirements for seed and plants.

Advanced

1.1.9 Conduct germination test.
1.1.10 Recognize the processing of ND plant products.
1.1.11 Describe different farming techniques.

Keys to Employability

Basic Skills

1. Reading→ Locates, understands, and interprets written information in prose and in documents such as manuals, graphs, and schedules.
2. Writing→ Communicates thoughts, ideas, information, and messages in writing; and creates documents such as letters, directions, manuals, reports, graphs, and flow charts.
3. Arithmetic/Mathematics→ Performs basic computations and approaches practical problems by choosing appropriately from a variety of mathematical techniques.
4. Listening→ Receives, attends to, interprets, and responds to verbal messages and other cues.
5. Speaking→ Organizes ideas and communicates orally.

Thinking Skills

1. Creative Thinking→ Generates new ideas.
2. Decision Making→ Specifies goals and constraints, generates alternatives, considers risks, and evaluates and chooses best alternative.
3. Problem Solving→ Recognizes problems and devises and implements plan of action.
4. Seeing Things in the Mind's Eye→ Organizes, processes symbols, pictures, graphs, objects, and other information.
5. Knowing How to Learn→ Uses efficient learning techniques to acquire and apply new knowledge and skills.
6. Reasoning→ Discovers a rule or principle underlying the relationship between two or more objects and applies it when solving a problem.

Standard 1: PLANT SCIENCE AND HORTICULTURE – Understand basic concepts and principles of plant science and horticulture.

Topic 2: Demonstrate fundamental skills in plant sciences and horticulture.

Student Competencies

Introductory

1.2.1 Classify plants by use and type (e.g. annuals, biennials, perennials, range).

1.2.2 Distinguish between monocots and dicots.

Core

1.2.3 Label the basic parts of the plant such as leaf, stem, root, and inflorescence.

Advanced

1.2.4 Calculate Animal Unit Months (AUMs).

1.2.5 Investigate current trends in plant science.

1.2.6 Investigate technological advances in plant sciences.

Keys to Employability

Personal Qualities

1. Responsibility→ Exerts a high level of effort and perseveres towards goal attainment.
2. Self-Esteem→ Believes in own self worth and maintains a positive view of self.
3. Sociability→ Demonstrates understanding, friendliness, adaptability, empathy, and politeness in group setting.
4. Self-Management→ Assesses self accurately, sets personal goals, monitors progress, and exhibits self-control.
5. Integrity/Honesty→ Chooses ethical courses of action.

Resources

1. Time→ Selects goal-relevant activities, ranks them, allocates time, and prepares and follows schedules.
2. Money→ Uses or prepares budgets, makes forecasts, keeps records, and makes adjustments to meet objectives.
3. Material and Facilities→ Acquires, stores, allocates, and uses materials or space efficiently.
4. Human Resources→ Assesses skills and distributes work accordingly, evaluates performance and provides feedback.

Standard 1: PLANT SCIENCE AND HORTICULTURE – Understand basic concepts and principles of plant science and horticulture.

Topic 3: Identify common weeds in ND and local community.

Student Competencies

Introductory

1.3.1 Describe common weeds in North Dakota.

Core

1.3.2 Classify prohibited and noxious weeds by plant and seed.

Advanced

1.3.3 Collect, identify, and label common weeds in ND.

Keys to Employability

Interpersonal

1. Participates as a Member of a Team→ Contributes to group effort.
2. Teaches Others New Skills.
3. Serves Clients/Customers→ Works to satisfy customers' expectations.
4. Exercises Leadership→ Communicates ideas to justify position, persuades and convinces others, responsibly challenges existing procedures and policies.
5. Negotiates→ Works toward agreements involving exchange of resources; resolves divergent interests.
6. Works with Diversity→ Works well with men and women from diverse backgrounds.

Information

1. Acquires and Evaluates Information.
2. Organizes and Maintains Information.
3. Interprets and Communicates Information.
4. Uses Computers to Process Information.

Standard 1: PLANT SCIENCE AND HORTICULTURE – Understand basic concepts and principles of plant science and horticulture.

Topic 4: Investigate career opportunities in the area of plant sciences.

Student Competencies

Introductory

1.4.1 Explore careers in plant sciences and horticulture.

Core

1.4.2 Link SAE areas to plant science.

1.4.3 Research professions within this field (e.g. interview professionals, skills required, job shadows, etc).

Advanced

1.4.4 Encourage the establishment of SAE's in plant science.

Keys to Employability

Systems

1. Understands Systems→ Knows how social, organizational, and technological systems work and operates effectively with them.
2. Monitors and Corrects Performance→ Distinguishes trends, predicts impacts on system operations, diagnoses deviations in systems' performance and corrects malfunctions.
3. Improves or Designs Systems→ Suggests modifications to existing systems and develops new or alternative systems to improve performance.

Technology

1. Selects Technology→ Chooses procedures, tools, or equipment including computers and related technologies.
2. Applies Technology to Task→ Understands overall intent and proper procedures for setup and operation of equipment.
3. Maintains and Troubleshoots Equipment→ Prevents, identifies, or solves problems with equipment, including computers and other technologies.

Standard 1: PLANT SCIENCE AND HORTICULTURE – Understand basic concepts and principles of plant science and horticulture.

Academic Cross Walk

English Language Arts

9.1.1	Choose a broad topic, state the problem, or question
9.1.3	Cross-reference information
9.1.4	Evaluate relevancy of information
9.1.5	Organize information from a variety of sources
9.1.6	Summarize information
9.1.7	Identify and avoid plagiarism
9.1.9	Use graphic organizer
10.1.1	Form questions to focus research
10.1.2	Know ways to effectively search electronic databases
10.1.3	Gather reliable information to support a thesis
10.1.4	Use relevant information
10.1.5	Organize information from a variety of sources into a unified whole
10.1.7	Paraphrase information
10.1.10	Write a research paper
9.2.15	Build vocabulary by reading a variety of grade-level texts and applying new vocabulary
9.3.3	Develop a composition detailing an opinion
9.3.5	Organize the ideas and details of a composition according to purpose
9.3.8	Use supporting details
9.3.10	Edit and revise compositions for proper mechanics and grammar, syntax, diction, and order
9.3.11	Arrange paragraphs in a logical progression
9.3.12	Use technology to present written work
10.3.1	Write expository texts including research papers
10.3.4	Organize the ideas and details of a composition according to purpose
10.3.5	Elaborate ideas through word choice and description using grade-level vocabulary
10.3.7	Use a variety of supporting details
10.3.8	Use language appropriate to the format of the composition
10.3.10	Use a specific point of view in compositions
10.5.2	Use media for a variety of purposes

Library/Technology Literacy

8.1.1	Define a research problem or task
8.1.2	Plan a research strategy
8.1.3	Access information using a variety of sources
8.1.4	Use a variety of criteria to evaluate and select information for research
8.1.5	Use organizational strategies to gather, record, and synthesize information
8.1.6	Present research
8.1.7	Evaluate the research process
8.2.1	Create media products focused for a variety of audiences
8.2.2	Select appropriate communication formats
8.2.3	Use a variety of strategies to present media products
8.2.4	Use a variety of techniques to evaluate the effectiveness of media products
8.3.1	Use appropriate terminology and concepts associated with media and technology
8.3.2	Use and refine skills and procedures needed to operate various media and technology
8.3.3	Develop troubleshooting strategies to solve technical problems
8.3.4	Use the most effective media and technology for specific needs
8.3.5	Understand the potential and limitations of existing media and technology
8.4.1	Collaborate in group projects and learning objectives
8.4.2	Develop competence in selecting from a variety of reading, listening, and viewing formats
8.4.3	Demonstrate self-motivation and increasing responsibility for learning by pursuing information related to personal interests
8.4.4	Understand different perspectives and the values and beliefs supporting them
8.5.1	Follow school guidelines for responsible use of technology and information resources
8.5.2	Use level-appropriate methods to cite and document reference sources
8.5.3	Demonstrate knowledge of intellectual property rights laws
8.5.4	Understand the past, present, and future impact of technology on society

Standard 1: PLANT SCIENCE AND HORTICULTURE – Understand basic concepts and principles of plant science and horticulture.

Academic Cross Walk

Mathematics

9-10.1.1	Express numbers between one-billionth and one billion in fraction, decimal, and verbal form; express numbers of all magnitudes in scientific notation
9-10.1.8	Apply estimation skills to predict realistic solutions to problems
9-10.1.9	Select and use a computational technique to solve problems involving real numbers
9-10.1.10	Explain the reasonableness of a problem's solution and the process used to obtain it
11-12.1.7	Add, subtract, and multiply complex numbers
9-10.2.9	Construct plane figures using traditional and/or technological tools
9-10.2.10	Recognize images of the same object shown from different perspectives
9-10.3.1	Construct appropriate displays of given data, i.e., circle graphs, bar graphs, histograms, stem-and-leaf plots, box-and-whisker plots, and scatter plots
9-10.3.2	Interpret a given visual representation of a set of data
9-10.3.7	Calculate measures of central tendency and spread, i.e., mean, median, mode, range, and quartiles
11-12.3.1	Choose, construct, and interpret a display to represent a set of data
9-10.4.1	Select appropriate units and scales for problem situations involving measurement
9-10.4.4	Given a conversion factor, convert between standard and metric measurements
9-10.4.5	Use methods necessary to achieve a specified degree of precision and accuracy in measurement situations
9-10.4.8	Given a formula list, compute the area of a regular polygon
9-10.4.9	Given a formula list, compute the surface area and volume of a right prism, right cylinder, right pyramid, right cone, and sphere
9-10.5.3	Given a formula list, compute the surface area and volume of a right prism, right cylinder, right pyramid, right cone, and sphere
9-10.5.7	Develop algebraic expressions, equations, or inequalities involving one or two variables to represent relationships found in various contexts
9-10.5.10	Solve a literal equation for a specified variable
9-10.5.13	Interpret a graphical representation of a real-world situation
9-10.5.14	Draw conclusions about a situation being modeled

Science

9-10.1.1	Understand the interaction of components within a system
9-10.1.6	Explain how models can be used to illustrate scientific principles
11-12.1.1	Understand the structure, organization, and dynamics of components within a system
9-10.2.1	Use appropriate safety equipment and precautions during investigations
9-10.2.2	Identify questions and concepts that guide scientific investigations
9-10.2.3	Formulate a testable hypothesis for a simple investigation
9-10.2.4	Identify the independent and dependent variables, the control, and the constants when conducting an experiment
9-10.2.5	Design and conduct a guided investigation
9-10.2.6	Maintain clear and accurate records of scientific investigations
9-10.2.7	Analyze data found in tables, charts, and graphs to formulate conclusions
9-10.2.8	Understand that scientific investigations sometimes result in new ideas
11-12.2.1	Use appropriate safety equipment and precautions during investigations
11-12.2.2	Select and use appropriate instruments, measuring tools, and units of measure to improve scientific investigations
11-12.2.3	Use data from scientific investigations in order to accept or reject a hypothesis
11-12.2.4	Formulate and revise explanations based upon scientific knowledge and experimental data
11-12.2.5	Use technology and mathematics to improve investigations and communications
11-12.2.6	Analyze data using appropriate strategies
11-12.2.7	Design and conduct an independent investigation
11-12.2.8	Communicate and defend a scientific argument
11-12.2.9	Understand that scientific explanations must adhere to criteria
11-12.2.10	Understand that new knowledge and methods emerge from different types of investigations and public communication among scientists
9-10.3.1	Classify elements according to similar properties.
9-10.3.2	Classify changes in matter as physical or chemical
9-10.3.3	Recognize the Law of Conservation of Matter in physical and chemical changes

Standard 1: PLANT SCIENCE AND HORTICULTURE – Understand basic concepts and principles of plant science and horticulture.

Academic Cross Walk

Science (cont.)

9-10.4.1	Relate cell function to cell structure
9-10.4.2	Relate the functions of cells in multicellular organisms to their cell type
9-10.4.3	Know the relationship between protein structure and function
9-10.4.6	Know how mitosis and meiosis differ
9-10.4.7	Apply the basic concepts of genetics to predict inherited traits
9-10.5.5	Know the effects of human activities on the environment
9-10.6.1	Use appropriate technologies and techniques to solve a problem
11-12.6.1	Select and use appropriate technologies, tools, and techniques to solve a problem
9-10.7.2	Understand factors that affect populations

Standard 2: ANIMAL SCIENCE – Understand basic concepts and principles of animal science.

Topic 1: Discover the scope and importance of animal science industry in North Dakota and United States.

Student Competencies

Introductory

2.1.1 Identify the economic impact of livestock industry.
2.1.2 Define biotechnology.

Core

2.1.3 Investigate current issues in animal science (e.g. BSE, COOL, EAIS, animal welfare, etc).
2.1.4 Identify products and by-products of the animal science industry.

Advanced

2.1.5 Debate current issues in animal science (e.g. BSE, COOL, EAIS, animal welfare, etc).
2.1.6 Investigate technological advances in animal sciences.
2.1.7 Analyze consumer demands and trends.

Keys to Employability

Basic Skills

1. Reading→ Locates, understands, and interprets written information in prose and in documents such as manuals, graphs, and schedules.
2. Writing→ Communicates thoughts, ideas, information, and messages in writing; and creates documents such as letters, directions, manuals, reports, graphs, and flow charts.
3. Arithmetic/Mathematics→ Performs basic computations and approaches practical problems by choosing appropriately from a variety of mathematical techniques.
4. Listening→ Receives, attends to, interprets, and responds to verbal messages and other cues.
5. Speaking→ Organizes ideas and communicates orally.

Standard 2: ANIMAL SCIENCE – Understand basic concepts and principles of animal science.

Topic 2: Demonstrate fundamental skills associated with animal science.

Student Competencies

Introductory

2.2.1 Define terminology associated with animal science.
2.2.2 Identify breeds of livestock.
2.2.3 Label external anatomical livestock parts.
2.2.4 Analyze the difference between genotype and phenotype.

Core

2.2.5 Determine principles of healthy animals.
2.2.6 Identify factors for promoting and maintaining animal health.
2.2.7 Explain quality assurance such as safe vaccination handling, use (e.g. BQA, etc.).

Advanced

2.2.8 Analyze performance data, Expected Progeny Difference (EPDs), and pedigrees.
2.2.9 Evaluate livestock through visual appraisal.
2.2.10 Investigate alternative/specialty animals.

Keys to Employability

Thinking Skills

1. Creative Thinking→ Generates new ideas.
2. Decision Making→ Specifies goals and constraints, generates alternatives, considers risks, and evaluates and chooses best alternative.
3. Problem Solving→ Recognizes problems and devises and implements plan of action.
4. Seeing Things in the Mind's Eye→ Organizes, processes symbols, pictures, graphs, objects, and other information.
5. Knowing How to Learn→ Uses efficient learning techniques to acquire and apply new knowledge and skills.
6. Reasoning→ Discovers a rule or principle underlying the relationship between two or more objects and applies it when solving a problem.

Standard 2: ANIMAL SCIENCE – Understand basic concepts and principles of animal science.

Topic 3: Describe the digestion and nutritional/feed requirements of livestock.

Student Competencies

Introductory

2.3.1 Discuss feedstuffs (e.g. types, terms, etc).

2.3.2 Determine differences in digestive systems (e.g. monogastric and polygastric).

Core

2.3.3 Recognize nutritional requirements of monogastric and polygastric animals.

2.3.4 Analyze feedstuffs (e.g. minerals, carbohydrates, protein, etc).

Advanced

2.3.5 Balance livestock rations using Pearson's square or other applications available.

2.3.6 Dissect the digestive system of monogastric and /or polygastric stomachs.

Keys to Employability

Personal Qualities

1. Responsibility→ Exerts a high level of effort and perseveres towards goal attainment.
2. Self-Esteem→ Believes in own self worth and maintains a positive view of self.
3. Sociability→ Demonstrates understanding, friendliness, adaptability, empathy, and politeness in group setting.
4. Self-Management→ Assesses self accurately, sets personal goals, monitors progress, and exhibits self-control.
5. Integrity/Honesty→ Chooses ethical courses of action.

Resources

1. Time→ Selects goal-relevant activities, ranks them, allocates time, and prepares and follows schedules.
2. Money→ Uses or prepares budgets, makes forecasts, keeps records, and makes adjustments to meet objectives.
3. Material and Facilities→ Acquires, stores, allocates, and uses materials or space efficiently.
4. Human Resources→ Assesses skills and distributes work accordingly, evaluates performance and provides feedback.

Standard 2: ANIMAL SCIENCE – Understand basic concepts and principles of animal science.

Topic 4: Describe the physiology of reproduction in livestock.

Student Competencies

Introductory

2.4.1 Explain terminology associated with reproductive physiology.
2.4.2 Identify parts of the reproductive tracts – male & female.

Core

2.4.3 Describe the function of the reproductive parts – male & female.
2.4.4 Interpret gestation tables.

Advanced

2.4.5 Diagram the reproductive systems.
2.4.6 Chart the estrous cycle.
2.4.7 Palpate a female reproductive system.
2.4.8 Evaluate semen collections.

Keys to Employability

Interpersonal

1. Participates as a Member of a Team→ Contributes to group effort.
2. Teaches Others New Skills.
3. Serves Clients/Customers→ Works to satisfy customers' expectations.
4. Exercises Leadership→ Communicates ideas to justify position, persuades and convinces others, responsibly challenges existing procedures and policies.
5. Negotiates→ Works toward agreements involving exchange of resources; resolves divergent interests.
6. Works with Diversity→ Works well with men and women from diverse backgrounds.

Information

1. Acquires and Evaluates Information.
2. Organizes and Maintains Information.
3. Interprets and Communicates Information.
4. Uses Computers to Process Information.

Standard 2: ANIMAL SCIENCE – Understand basic concepts and principles of animal science.

Topic 5: Investigate career opportunities in the area of animal sciences.

Student Competencies

Introductory

2.5.1 Explore careers in animal sciences.

Core

2.5.2 Link SAE areas to animal science.

2.5.3 Research professions within this field (e.g. interview professionals, skills required, job shadows, etc).

Advanced

2.5.4 Encourage the establishment of SAE's in animal science.

Keys to Employability

Systems

1. Understands Systems→ Knows how social, organizational, and technological systems work and operates effectively with them.
2. Monitors and Corrects Performance→ Distinguishes trends, predicts impacts on system operations, diagnoses deviations in systems' performance and corrects malfunctions.
3. Improves or Designs Systems→ Suggests modifications to existing systems and develops new or alternative systems to improve performance.

Technology

1. Selects Technology→ Chooses procedures, tools, or equipment including computers and related technologies.
2. Applies Technology to Task→ Understands overall intent and proper procedures for setup and operation of equipment.
3. Maintains and Troubleshoots Equipment→ Prevents, identifies, or solves problems with equipment, including computers and other technologies.